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NOTES AND LITERATURE

ECHINODERMATA

Renewed Interest in Recent Crinoids.—Since the lamented death of Dr. P. H. Carpenter in 1891, the recent crinoids have received little attention as compared with the other classes of echinoderms. Aside from the obvious difficulty of securing material, this has been due to certain inherent difficulties which systematic work in this class affords. Carpenter and his successors have recognized but few genera, the largest of these being cosmopolitan in distribution, and the numerous species have appeared to be ill-defined and extremely variable. Consequently aside from A. Agassiz's great monograph on *Calamocrinus*, a few systematic papers by Hartlaub, Bell, Koehler, Döderlein and Chadwick, a monograph on *Antedon bifida*, by the last, and an important morphological paper, on arm-regeneration in Comatulids by Minckert, our knowledge of the recent crinoids, and particularly our understanding of the interrelationships of the subordinate groups, was, at the beginning of 1907, about where it was left by Carpenter nearly twenty years before. The cruise of the "Albatross" in the North Pacific in 1906 afforded one of her naturalists, Mr. Austin Hobart Clark, exceptional opportunities for the study of recent crinoids and recognizing the responsibility thus laid upon him, Mr. Clark has during the past year made numerous and important contributions to our knowledge.

His first paper, "Two New Crinoids from the North Pacific Ocean,"¹ gives a figure and description of a most remarkable new stalked crinoid, for which the name *Phrynoerinus* is proposed, and of a new species of *Bathyerinus*, a well-known deep-sea genus of stalked crinoids. So remarkable does *Phrynoerinus* appear to be that it is suggested a new family, "Phrynoerinidae," be established for it. The characters of this family are unfortunately not suggested, and to one having only an indistinct idea of the characters upon which the already very large number of families (mostly extinct) of stalked crinoids is based, the proposal of a new family does not make a strong appeal.

On the same date, Mr. Clark published a paper on "A New

¹ *Proc. U. S. Nat. Mus.*, 32, pp. 507-512.

Species of Crinoid (*Ptilocrinus pinnatus*) from the Pacific Coast, with a Note on *Bathyerinus*,² in which another remarkable genus of stalked crinoids is described and figured, and there is a discussion of some of the specific names used in *Bathyerinus*. The new genus is considered to be related to the interesting *Calamocrinus* which the "Albatross" collected some years ago near the Galapagos Islands.

A paper on "Crinoids of the Genus *Eudioocrinus* from Japan"³ bears the same date as the two preceding. *Eudioocrinus* is a genus of free-swimming crinoids (comatulids) remarkable for having united radials, but only five arms. Two species were found to be common along the southern coast of Japan, and three specimens of a third, which is described as new, were also taken by the "Albatross." A summary of the genus, with a synonymy of its seven species and statements of the type-localities closes the paper. Two papers dealing with "New Species of Recent Unstalked Crinoids"⁴ appeared in September and give us a little insight into the extraordinary wealth of material which the "Albatross" collected, for we have here descriptions of no less than 55 new species, of which 52 belong to the genus *Antedon* as used by previous writers. Mr. Clark points out that the commonly used generic name *Actinometra* is untenable, being a pure synonym of Lamarck's older name *Comatula*. As the free-swimming crinoids are now so commonly called comatulids, it is not an unwelcome discovery which thus rehabilitates *Comatula*. Free use is made of artificial keys in these papers, although their usefulness is impaired by their doubtless necessary limitation to the new species and two or three most nearly related forms. There is plain intimation that Carpenter's "groups" of the genus *Antedon* are not in all cases natural or satisfactory divisions and that a rearrangement of the species is necessary.

In his next paper, "New Genera of Recent Free Crinoids,"⁵ Mr. Clark attacks this problem and shatters the old genus *Antedon* into eighteen fragments, entirely discarding the group arrangement of Carpenter. At first thought this seems like needlessly drastic treatment, but the more one studies Mr. Clark's reasons and results, the more satisfied one becomes that such treatment is unavoidable if we are to get at the true interrelation-

² *Proc. U. S. Nat. Mus.*, 32, pp. 551-554.

³ *Proc. U. S. Nat. Mus.*, 32, pp. 569-574.

⁴ *Proc. U. S. Nat. Mus.*, 33, pp. 69-84 and 127-156.

⁵ *Smith. Misc. Coll.*, 50, pp. 343-364.

ships of the comatulids. Few zoologists realize how many species of recent comatulids are now known, and it may therefore be of interest to point out that while only four of the new genera proposed are monotypic, five have more than eighteen species each and one of these has over fifty. Mr. Clark's selection of new names for his genera is particularly to be commended, as all are derived from the Greek, terminate in *-metra*, and are euphemistic.

During the summer, Mr. Clark worked at the Museum of Comparative Zoölogy and some of the results of his work appeared in January in a paper, entitled "Notice of Some Crinoids in the Collection of the Museum of Comparative Zoölogy."⁶ In addition to the description of eight new species, there is an important note on six-rayed crinoids, a key to the genus *Bathy-crinus* in which eight species are recognized, a table showing the bathymetrical and geographical distribution of *Bathy-crinus*, and finally a "Key to the genera of *Antedonidae*." This key is an enlargement and slight rearrangement of the one published in October and includes two additional genera, both of which seem to be well-defined.

Not content with systematic work alone, Mr. Clark shows his interest in crinoid morphology, and the larger questions involved when the geological history of the class is considered, by a very important paper on "Infrabasals in Recent Genera of the Crinoid Family *Pentacrinitidae*,"⁷ in which he demonstrates, apparently beyond doubt, the presence of infrabasals in *Isocrinus decorus* and *Metacrinus rotundus*. As no less an authority than Carpenter himself "positively asserts that they do not exist in the recent *Pentacrinitidae*," this discovery is very interesting.

Having found how heterogeneous a group the old genus *Antedon* is, Mr. Clark's attention was naturally turned next to the equally well-known genus *Comatula*, and the results are given in "The Crinoid Genus *Comatula* Lamarek; with a Note on the *Encrinus parrae* of Guérin."⁸ It is interesting to know that *Comatula* is far more homogeneous than might have been expected and requires the coinage of no new generic names and the revival of only a single old one, *Comaster*. The latter however, includes 43 of the 50 species hitherto called *Comatula* (or *Actinometra*). The note on *Encrinus parrae* is important and interest-

⁶ *Bull. M. C. Z.*, 51, pp. 233-248.

⁷ *Proc. U. S. N. M.*, 33, pp. 671-676.

⁸ *Proc. U. S. N. M.*, 33, pp. 683-688.

ing for it clearly shows that the familiar name *Pentacrinus mülleri*, which has been used for a well-known West Indian crinoid for over half a century must give way to the combination *Isocrinus parrae* (Guérin), the specific component of which antedates *mülleri* by over twenty years.

Although the genus *Antedon* of previous writers had already yielded him nineteen new genera, Mr. Clark's indefatigable labors convinced him that the residue left therein (some 36 species) was not a homogeneous or natural group. In his "New Genera of Unstalked Crinoids,"⁹ he has analyzed it and resolved it into thirteen elements, three of which are monotypic and three contain only two species each. Although he names his new genera with his customary skill and euphony, and gives the genotype and other species of each, he does not tell us what is left for *Antedon* s. str., and if we attempt to figure it out for ourselves, we reach the remarkable conclusion that *Antedon* as now limited contains *minus 7* species! For, in October Mr. Clark said that *Antedon* (in the restricted sense in which he then used the name) contained 36 species. Since October he has described two additional species, which would give him 38 species for the new genera described in April. But these 12 new genera contain a total of 45 species, and therefore *Antedon* s. str. must now have — 7 species! Whether this discrepancy is due to the shifting of the limits of some of his earlier genera, or to species of other writers which he had previously overlooked, or to *nomina nuda* introduced in the paper under discussion, we shall leave to Mr. Clark to explain at some future time.—Besides his new genera of *Antedonidæ*, Mr. Clark splits *Eudioocrinus* into two genera which he considers fundamentally distinct, and he then proposes no less than *eight* families of comatulids, with 39 genera. As he gives no definitions, or even a key, to these families, we can not express an opinion as to their validity. We can only wonder if Mr. Clark's enthusiasm is not leading him to magnify relatively unimportant details into significant morphological differences, and blinding him to the fundamental similarities of structure which the *Antedonidæ* show.

The ten papers here reviewed are sufficient to convince any one that their writer is a worker of extraordinary industry and enthusiasm. More than this, however, they give promise that Mr. Clark is to become a worthy successor to Carpenter as an authority on recent crinoids. Situated where the great collections

⁹ *Proc. Biol. Soc. Wash.*, 21, pp. 125-136.

of the National Museum, which, thanks to the "Albatross," probably contain the largest and finest lot of crinoids in the world, are constantly available, his opportunities are most unusual and it must be a source of pleasure and gratification to all students of echinoderms that he is living up to them so well. His work reveals unusual powers of analysis and of skill in making his distinctions tangible, as witness his artificial keys to genera and species which seem to be very usable. He is quick to see a new point in structure or a new interpretation of some point already known, and while he treats the work of Carpenter and other writers with the courtesy and consideration they deserve, he does not hesitate to point out errors or misinterpretations which they have made. If he possesses the necessary patience and persistence, there is every reason to believe that Mr. Clark's work will prove epoch-making in the history of crinoid morphology and taxonomy.

Two faults seem to the present reviewer to mar Mr. Clark's work so far, and it is greatly to be hoped that he will have the courage and self-control to eliminate them in the future. One is a tendency to rush into print on the discovery of each new fact or group of facts, and the consequent result is a multiplication of titles to afflict all future workers, and a decided weakening of the value of each of his papers. Had Mr. Clark made four papers out of the ten which have already appeared, not only would bibliographers have blessed him, but his work would at least seem to have more of the weight and dignity which its quality shows it to deserve.—The other fault is a far more serious one and appears to be the cause of whatever errors and ambiguities mar Mr. Clark's work. It is hastiness in reaching a conclusion, hastiness in grouping the conclusions reached and hastiness in preparing his results for the press. In a word, haste is Mr. Clark's besetting sin and threatens to be the source of much quite avoidable trouble. As an illustration of what is meant by this criticism, reference may be made to some points in Mr. Clark's paper, "New Genera of Unstalked Crinoids." In his introductory remarks, he corrects four or five slight errors in his earlier papers, all of which might fairly be said to have been caused by haste. Under *Thaumatometra*, "*Antedon ciliata* A. H. Clark, 1907 (= *Antedon tenuis* A. H. Clark, 1907)," is given as the genotype, but neither *ciliata* nor *tenuis* appear in the list of species referable to the genus. Moreover, if we go back a little we find that while *tenuis* and *ciliata* were described

in September, in October Mr. Clark substituted the name *stella* for *tenuis* as the latter is preoccupied. Now are we to understand that Mr. Clark has concluded his three names refer to a single species? If so the description of *tenuis* and *ciliata* as distinct species was, to say the least, hasty. Again, under *Comp-sometra*, we find the following bit of evidence of haste in preparation: certain characters "distinguish this species at once. The two species at present known are," etc. Evidently the first "species" should read "genus." Under *Isometra*, Mr. Clark says that the name *challengeri* which he bestowed on an *Antedon* in 1907 is a synonym because it was given "before its relation to *angustipinna* was detected." Under *Pentametrocrinus* attention is called to an important morphological feature of certain species of *Eudioocrinus*, which "seems to have escaped the notice of all subsequent workers," and yet Mr. Clark himself published, less than a year ago, quite a paper on *Eudioocrinus*, with description of a new species and an annotated list of all previously known ones. Finally, in concluding his paper, Mr. Clark says, "The genera of free crinoids belonging to the *Comatulida* may be grouped as follows," and he then gives eight families with their various genera. But we fail to find the *Atelecrinidae* or the genus *Atelecrinus* mentioned, and we can only guess whether the genus is considered synonymous with one of those given (which hardly seems possible) or is omitted through carelessness. Now while it is true that none of these slips is serious, Mr. Clark has not hesitated to criticize other writers for very similar blunders, and their presence in his work necessarily affects our estimate of its reliability. It is of the greatest importance, if the mantle of Carpenter is to rest becomingly on his shoulders, that in his future work, Mr. Clark reveal a greater patience, a more controlled enthusiasm and a more painstaking care in the preparation of his results for publication.

H. L. C.

ANIMAL BEHAVIOR.

Recent Work on the Behavior of Higher Animals.—The members of the genus *Mus*—the rats and mice—seem in a fair way to become the classic animals for comparative psychology, as the frog has long been for physiology. The work of the Harvard school, examined in our last review, dealt largely with these animals. The recent work of the Chicago laboratory is concentrated even more precisely on the white rat.